Understanding the distracted brain

Why driving while using hands-free
cell phones is risky behavior

National Safety Council
White Paper

making our world safer®

Motor Vehicle Crashes

- No. 1 cause of death
- An estimated 39,000 to 46,000 people killed in crashes every year
- More than 2.2 million injuries from crashes in 2008

Distractions now join alcohol and speeding as leading factors in fatal and serious injury crashes.

Distracted Driving

- Driver distractions leading factor in fatal and serious injury crashes

- In 2008, 28% of all crashes attributable to cell phones
  - 1.6 million crashes
  - 645,000 injuries

- Cell phone users 4x as likely to crash

Millions of People are Talking While Driving

- 11% of drivers at any point during the day are on cell phones

- 81% of drivers admit to talking on cell phone while driving:
  - 74% of Boomers
  - 88% of Gen X
  - 89% of Gen Y
  - 62% of Teen Drivers

Millions of People are Texting While Driving

- 18% of drivers admit to texting while driving:
  - 4% of Boomers
  - 15% of Gen X
  - 39% of Gen Y
  - 36% of Teen Drivers

Driving Culture Change

"A century ago, Model T's brought motoring to an emerging middle class.

A half century ago, teenagers cuddled in convertibles at drive-in movies.

A new generation of drivers see cars as an extension of their plugged-in lives, with iPods, DVD players and other gadgets."

USA Today, 2-17-2009

Driving Culture Change

- Webster's Dictionary named "distracted driving" its 2009 Word of the Year

- In 2009:
  - More than 200 state bills introduced
  - U.S. DOT Distracted Driving Summit held
  - President Obama signed Executive Order
  - NSC membership survey
  - Favorable public opinion polls

How Cell Phones Distract

- Visual – Eyes off road
- Mechanical – Hands off wheel
- Cognitive – Mind off driving

CHALLENGE: Drivers don't understand or realize that talking on a cell phone distracts the brain and takes focus away from the primary task of driving.

The Problem

- Hands-free seen as solution and mistakenly believed to be safer than handheld
- People recognize the risk of talking on handheld and texting more than the risk of hands-free
- Most legislation focuses on only handheld devices or texting
- All state laws and some employer policies allow hands-free devices

Hands-free devices offer no safety benefit when driving.

What is a Hands-Free Device?

- Headset that communicates via wire or wireless connection to cell phone

- Factory-installed or aftermarket feature built into vehicle (voice recognition)

Cognitive Distraction

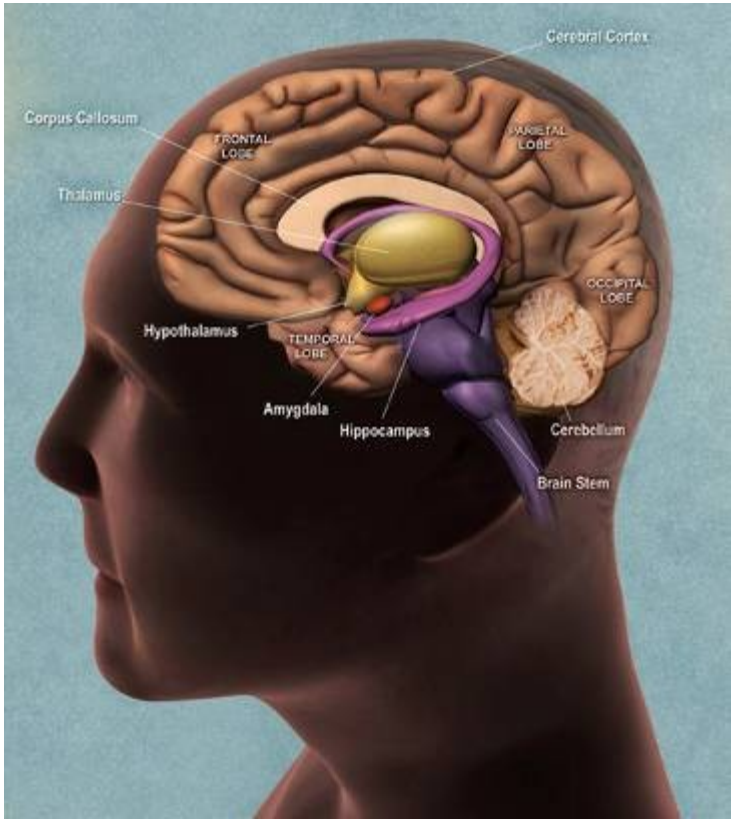
- Cognitive distraction still exists with hands-free
  - Talking occurs on both handheld and hands-free cell phones
  - Mind focuses on conversation
  - Listen and respond to disembodied voice

Hands-free devices do not eliminate cognitive distraction.

Multitasking: A Brain Drain

- Multitasking for the brain is a myth

- Human brains do not perform two tasks at same time
  - Brain handles tasks sequentially
  - Brain switches between one task and another



The four lobes of the brain.

Source: National Institutes of Health

Multitasking: A Brain Drain

Brain engages in a constant process to:

1. ***Select*** information brain will attend to
2. ***Process*** information
3. ***Encode*** to create memory
4. ***Store*** information

It must also:

5. ***Retrieve***
6. ***Execute*** or act on information

When brain is overloaded these steps are affected

Multitasking: A Brain Drain

Encoding Stage

- Brain filters information due to overload
- Drivers not aware of information filtered out
- Information does not get into memory
- Drivers miss critical information on potential hazards

Inattention blindness and encoding.

Source: National Safety Council

Multitasking: A Brain Drain

- Brain juggles tasks, focus and attention
- Brain switches between primary and secondary tasks
- Inattention blindness
  - When people do 2 **cognitively complex** tasks (driving and using a cell phone), causing brain to shift focus
- Bottleneck
  - Different regions of brain must pull from a shared and limited resource for unrelated tasks

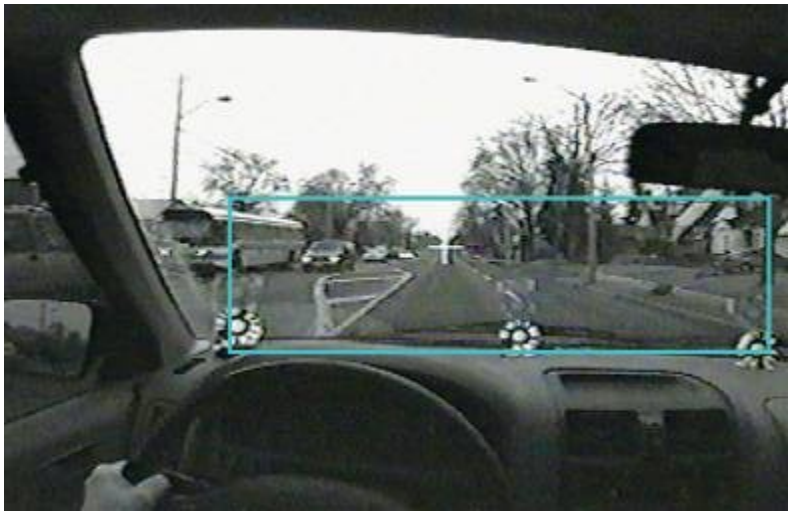
Inattention Blindness

- A type of cognitive distraction
  - "looking" but not "seeing"

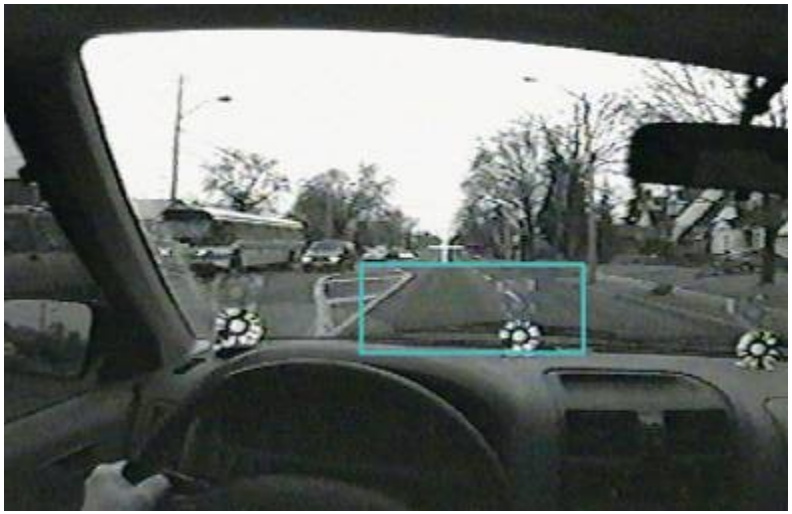
- Hands-free drivers **less** likely to see:
  - High and low relevant objects
  - Visual cues
  - Exits, red lights and stop signs
  - Navigational signage
  - Content of objects

Inattention Blindness

A narrowed scope



Where drivers not using a hands-free cell phone looked.



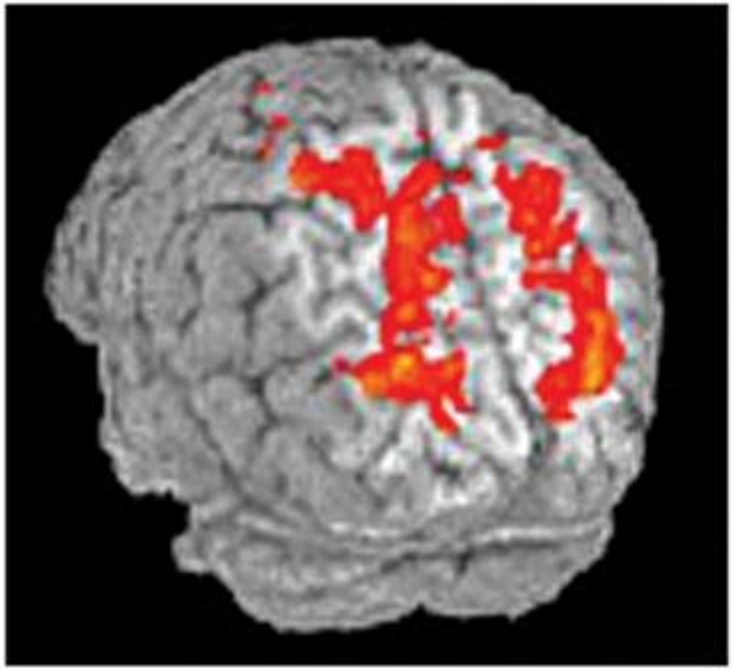
Where drivers using a hands-free cell phone looked.

Source: Transport Canada

Multitasking: Impairs Performance

- Carnegie Mellon University Study (2008)
- Took fMRI pictures of brain while drivers listened to sentences and drove simulator
- Literally see the results…

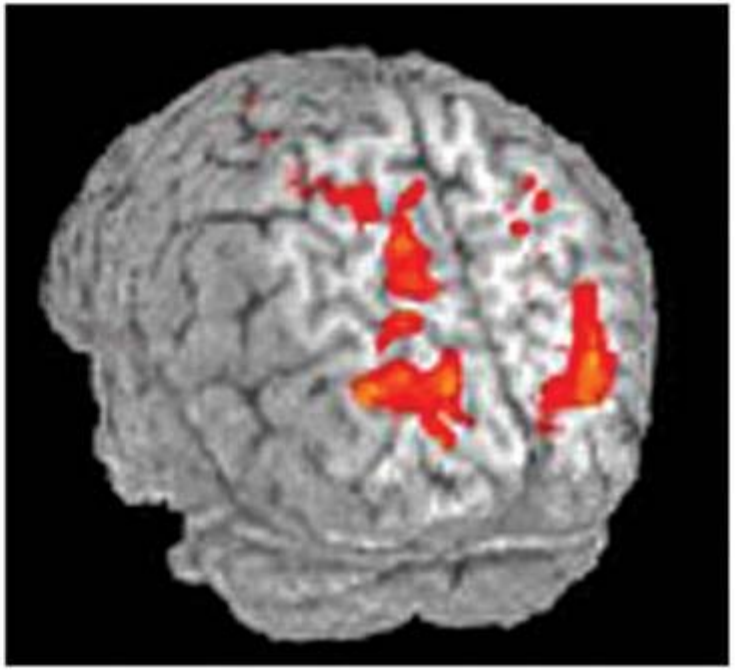
Driving alone



L

R

Driving with sentence listening



L

R

Functional magnetic resonance imaging images.

Source: Carnegie Mellon University

Multitasking: Impairs Performance

- Just listening to sentences on cell phones decreased activity by 37% in the brain's parietal lobe which perceives movement, integrates sensory information and also has importance for language processing

- Listening and language comprehension drew cognitive resources away from driving

- Also decreased activity in brain's occipital lobe which processes visual information

Multitasking: Impairs Performance

- We can walk and chew gum safely because it is not a cognitively-demanding task

- But even cell phone-using pedestrians act unsafely. They are less likely to:
  - Look for traffic before stepping into street
  - Look at traffic while crossing street
  - Notice unusual objects placed along path

Multitasking: Impairs Performance

- Driving involves a more complex set of tasks than walking:
  - Visual
  - Manual
  - Cognitive
  - Auditory

- A driver's job is to watch for hazards, but this cannot be done when brain is overloaded

Cell Phone: Driver Risks

- Inattention blindness
- Slower reaction/response times
- Problems staying in lane

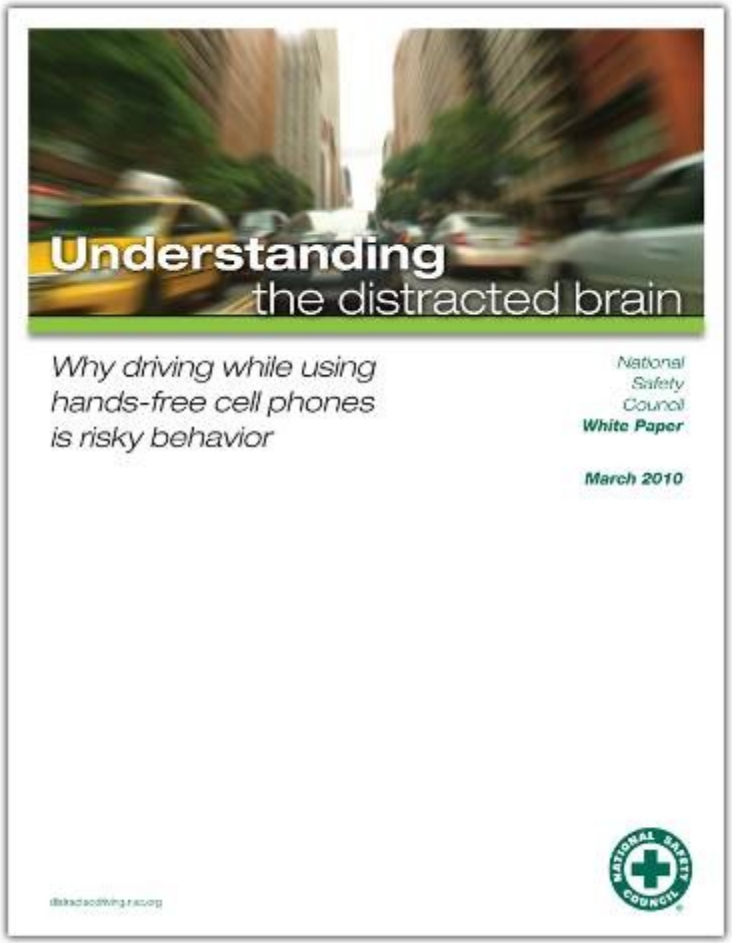
Passenger Conversations

- Adult passengers share awareness of driving situation, a safety benefit
- Front seat passengers reduce risk of crashing by 38% compared to cell phone conversations
- Adults with passengers have lower crash rates than adults without passengers
  - Not true for novice teen drivers

Prevention Steps

- Widespread education
- Corporate cell phone bans
- Legislation
- Law enforcement
- Technology

Download the NSC White Paper



nsc.org

More than 1.6 million crashes are caused by cell phone use and texting
while driving each year.

Joe, 12

Bailey, Merideth, Hannah, Sara and Katie

Cady, 16

Erica, 9

Jean and Jay, 58

Countless lives

have been lost as a result.

Linda, 61

Jason, 38

Lauren, 17

Matt, 25

Frances, 13

Jordan, 18

Help us save lives.
Tell everyone you know.

On the Road, Off the Phone